REMARKS

This Amendment is filed in response to the Office Action dated Dec. 26, 2007 and in connection with a Petition for a 1-Month Extension of Time. The Applicant respectfully requests reconsideration of the pending rejections.

Claims 2-10, 12-16, 18, 23-26 and 28-29 are pending in the case.

Claims 2, 3, 10, 12-15, 23 and 29 were amended. Support for the amendments to the claims may be found in the Specification at page 4, line 25-30, page 5, lines 8-10, page 5, line 28 to page 6 line 4, page 7, lines 1-9 and lines 22-25, and page 8, lines 4-12, among other places in the specification.

Claim 27 was cancelled.

No new claims were added.

Claim Rejections – 35 U.S.C. §101

At paragraph 11 of the Office Action, claims 2-10, 12-16, 18 and 23-28 were rejected under 35 U.S.C. §101.

However at paragraph 11 of the Office Action, the Examiner agrees that claim 29, which recites "building a calibrated water distribution model using the desired set of calibration parameters," is drawn to statutory subject matter.

While the Applicant still traverses this rejection, to advance the prosecution of the case, the Applicant amends independent claims 2, 10 and 23 to contain a limitation similar to that in claims 29. Accordingly, it is believed there will be agreement that the claims are statutory.

Claim Rejections – 35 U.S.C. §112, first paragraph

At paragraph 12 of the Office Action, claim 3 was rejected under 35 U.S.C. §112, first paragraph in connection with the enablement requirement. Specifically, the Examiner states "the claim does not enable one of ordinary skill in the art to make and use the

invention because it does not enable weighting factors one of linear, square, square root or log function."

While the Applicant still traverses this rejection, to advance the prosecution of the case, the Applicant removes the limitation relating to "linear, square, square root or log function" from the claim. Accordingly, it is believed there will be agreement that the remaining portions of the claim are enabled.

Claim Rejections – 35 U.S.C. §103

At paragraph 15 of the Office Action, claims 2-5, 7-10, 12-16 and 23-29 were rejected under 35 U.S.C. §103(a) over Walters et al., titled "Calibration of Water Distribution Network Models Using Genetic Algorithms" (hereinafter "Walters") in view of "WaterCAD for Windows, On-Line Help Text", Version 3.0, 1997 (hereinafter "WaterCAD 3.0").

The Applicant's claim 2, representative in part of the other rejected claims, sets forth:

> 2. (CURRENTLY AMENDED) A method of automatically calibrating a water distribution model of a water distribution network, comprising the steps of:
>
> (A) ***selecting calibration parameters to be adjusted to calibrate the water distribution model, the calibration parameters including link status*** and one or more of, pipe roughness and junction demand;
>
> (B) ***collecting*** field observed data including a pipe flow measurement and a junction pressure measurement for at least one point in the water distribution network, and including corresponding loading conditions and ***boundary conditions describing settings of valves or pumps that existed in the network when said field observed data was collected and passing such information to a genetic algorithm module***;
>
> (C) generating at said genetic algorithm module a population of calibration solutions that comprise a set of calibration results, using a genetic algorithm;
>
> (D) running multiple hydraulic simulations of each solution to ***obtain a set of predictions*** of pipe flows and junction pressures at selected points in the network, ***corresponding to the*** loading conditions and ***associated boundary conditions*** when the field observed data was collected;

(E) performing a calibration evaluation including computing a goodness-of-fit value for each calibration solution based upon differences between field observed values and said predictions;

(F) repeating steps (C) through (E) until a user-selected desired goodness-of-fit value is obtained resulting in a corresponding calibration solution for calibrating a water distribution model; and

(G) building a calibrated water distribution model using the desired set of calibration parameters.

Walters discusses a technique for calibrating a model by "**adjusting pipe roughnesses** until pressure and flow values predicted by the model are consistent with field measurement." *See* page 132, 1st paragraph (emphasis added). "This is achieved by performing a large number of runs of the network model using trial values of pipe roughness, which are adjusted throughout the process using the principles of natural evolution," in a genetic algorithm. *See* page 132, 2nd paragraph. Walters also mentions demands and pipe diameter may be adjusted as variables, though discourages this, stating it is "not common practice." *See* page 132, 4th paragraph and 133, 1st paragraph. Trials are performed using the pipe roughness variable and the results of these trials are pressures and flow values. *See* page 132, 1st paragraph and page 135, 1st full paragraph (stating "the network model to be run…**to obtain the simulated heads and flows**…"). The resulting pressure and flow results are compared with field measurements. *See* page 132, 1st paragraph and page 135, 1st full paragraph and abstract.

WaterCAD 3.0 discusses that a model may include "pipe status" that "indicates whether the pipe is open or closed", "pump status" that indicates "status conditions; On (normal operation), Off (no flow under any conditions)" and "valve status" that "can have several different status conditions." *See* page 7-31. In separate discussion, WaterCAD 3.0 discusses calibrating a model. *See* page 8-33. Two different "calibration factors" may be manually experimented with until you find the one that causes your calculation results to most closely correspond with your observed field data. These two calibration factors are "Demand" and "Roughness." *See* page 8-33.

First, the Applicant respectfully urges that Walters and WaterCAD 3.0 do not teach or suggest the Applicant's claimed "***collecting...boundary conditions describing settings of valves or pumps that existed in the network when said field observed data was collected and passing such information to a genetic algorithm module***" and "***obtain a set of predictions ...corresponding to the ... associated boundary conditions.***"

In addition to collecting field observed data that includes pipe flow and junction pressure measurements, the Applicant also collects ***boundary conditions describing settings of valves or pumps that existed in the network when said field observed data was collected***. The boundary condition information is ***passed*** along with the pipe flow and junction pressure measurements ***to a genetic algorithm module***. By making boundary conditions describing the settings of valves or pumps available to the genetic algorithm module, greater accuracy can be achieved as changes in these settings over time can be accounted for. The Applicant teaches at page 3 lines 3-14 of the specification that:

> [t]here are several disadvantages to the traditional calibration methods. One such disadvantage is, in a steady-state simulation, it is desired to provide no changes during field observation in the relevant aspects of the network. And yet, the observation itself could incorporate data from different network states. More specifically, an engineer or perhaps several engineers, take measurements in the field sequentially. During the time elapsed between taking the various measurements, the state or condition of certain aspects of the network can change. A simple, but illustrative, example is that of an engineer measuring pipe flow at location A, at which time a network pump may be in an "ON" position, thus the pump is operating. Later, when the engineer takes a field observed measurement at location B, the pump may now be in an "OFF" state, which would change pipe flow (and pressure) readings within the network. The network has changed during the observance of the data in the field, thus affecting the accuracy of the results.

Walters makes no mention of collecting boundary conditions describing the settings of valves or pumps that exists in the network when pressure and flow data is collected, and passing such boundary information to a genetic algorithm module. While Walters takes "snapshots" of real-world pressure and flow over a "24-hour cycle" (*see* page 135, 1st full paragraph), Walters seems to ignore that boundary conditions could

change over that span of time. Instead of using boundary conditions to make sense of the collected pressure and flow data, Walters simply excludes certain field data he believes do not make sense (*see* page 135, last paragraph to top of page 136), and accepts some anomalies in his results (*see* page 139, 2nd and 3rd paragraphs).

The deficiencies of Walters are not remedied by combination with WaterCAD 3.0. As WaterCAD 3.0 does not even mention a genetic algorithm module, WaterCAD 3.0 certainly cannot suggest passing boundary conditions describing settings of valves or pumps to a genetic algorithm module.

Accordingly, the Applicant respectfully urges that the combination of Walters and WaterCAD 3.0 is legally insufficient to make obvious the present claims under 35 U.S.C. §103(a).

Second, the Applicant respectfully urges that both Walters and WaterCAD 3.0 do not teach or suggest the Applicant's claimed "***selecting calibration parameters to be adjusted to calibrate the water distribution model, the calibration parameters including link status***."

During the prior prosecution of the case, there has been ongoing disagreement regarding whether "pipe flow" and "link status" are equivalent. While the Applicant still maintains they are not, even assuming for purposes of argument the Examiner's interpretation that they are, what is claimed by the Applicant is not shown in Walters. The Applicant uses link status as a calibration parameter ***to be adjusted to calibrate the water distribution module.*** In contrast, Walters measures pipe flow in the real world (i.e., as "field data"), and compares this with simulated pipe flow results generated in a trial. This is made clear at Walters' page 132, 1st paragraph, which states "[m]odel calibration essentially comprises **adjusting pipe roughness until pressure and flow values predicted by the model are consistent with field measurements**" (emphasis added). Walters never suggests pipe flow should be adjusted as a calibration parameter. It is a result to be compared.

The deficiencies of Walters are not remedied by combination with WaterCAD 3.0. While WaterCAD 3.0 mentions a model may include information regarding pipe status, pump status and valve status, there is no suggestion that this status information should be used as a calibration parameter to be is adjusted to calibrate the model. The Applicant respectfully directs the Examiner's attention to page 8-33 of WaterCAD 3.0. There, calibration of a model is discussed, and it is taught that either demand or roughness may be used as calibration parameters. No mention is made of adjusting pipe status, pump status or valve status as calibration parameters.

Accordingly, the Applicant respectfully urges that the combination of Walters and WaterCAD 3.0 is legally insufficient to make obvious the present claims under 35 U.S.C. §103(a) due to the absence of "***selecting calibration parameters to be adjusted to calibrate the water distribution model, the calibration parameters including link status***."

At paragraph 16 of the Office Action, claims 6 and 18 were rejected under 35 U.S.C. §103(a) over Walters in view of Official Notice.

The Applicant respectfully urges that claims 6 and 18 are allowable due to their dependency from allowable independent claims, as well as for other separate reasons.

In summary, all the independent claims are believed to be in condition for allowance and therefore all dependent claims that depend there from are believed to be in condition for allowance. The Applicant respectfully solicits favorable action

Should the Examiner desire telephonic contact, the Examiner is encouraged to call the undersigned attorney at (617) 951-2500.

Please charge any additional fee occasioned by this paper to our Deposit Account No. 03-1237.

Respectfully submitted,

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